

Auburn University and USDA/Natural
Resources Conservation Service

Alabama Aquaculture
Best Management Practice (BMP)

Feed Management

BMP No. 7



Definition

Feed is applied to channel catfish ponds to allow greater production of fish than possible with natural food organisms. Feeds are composed of a mixture of feed stuffs to include plant meals, fish meal, and grains as well as vitamins and mineral premixes that provide adequate amounts of essential nutrients and energy necessary for their utilization. Uneaten feed, feces, and metabolic wastes contribute nutrients to pond water. Good feed management minimizes nutrient inputs into pond water and is an important aspect of water quality management in catfish farming.

Explanation

Fish do not convert all of the applied feed to flesh. Fish harvested from ponds usually contain about 7.5 to 15% of organic matter, 20 to 30% of nitrogen, and 25 to 35% of phosphorous applied to ponds in feed. The difference in the input of a substance in feed and the amount of this substance in harvested fish represents the amount of the substance that enters the pond ecosystem as uneaten feed and in fish feces and metabolites. Uneaten feed and feces are decomposed to metabolites by pond bacteria. The metabolites of most interest are carbon dioxide, ammonia, and phosphate, because these substances are basic nutrients for production of phytoplankton. They also represent potential pollutants in pond effluent.

Nutrient inputs and phytoplankton abundance in ponds increase as feeding rates increase. Mechanical aeration is used to maintain adequate dissolved oxygen concentrations and

to favor oxidation of ammonia to nitrate by nitrifying bacteria. However, if feeding rates exceed 100 to 120 lb/acre per day, water quality in ponds tends to deteriorate unless mechanical aeration is increased substantially. Deterioration of water quality in ponds stresses fish and causes them to eat less, grow slowly, and to be more susceptible to disease. Moreover, effluents from ponds with lowered water quality have an increased pollution potential.

Feeds and management

Practices

- *Select high quality feeds that contain adequate, but not excessive, nitrogen and phosphorous.*
- *Store feed in well-ventilated, dry bins, or if bagged, in a well ventilated, dry room. The feed should be used on a first in and first out basis by the expiration date suggested by the manufacturer.*
- *Apply feed uniformly with a mechanical feeder.*
- *Do not apply more feed than fish will eat.*
- *Maintain adequate dissolved oxygen concentrations in ponds to prevent fish stress and enhance the capacity of the pond to assimilate metabolic wastes.*
- *Daily feed application should not exceed 30 lb/acre in un-aerated ponds. In ponds with 2 hp of aeration per acre, daily feed application usually can be increased to*

100 to 120 lb/acre. These feed amounts are the maximum amounts to be applied on a given day. They are not annual averages.

Implementation notes

Because feed is the main source of nutrients in ponds, good feed management, reasonable stocking and feeding rates, and adequate mechanical aeration is the best way to enhance effluent quality. Use of high quality feed that has no more nitrogen and phosphorous than necessary is important. Reasonable percentages of these elements in feeds for grow-out are 4.5 to 5.1% (28 to 32% crude protein) for nitrogen and 0.75 to 1.0% phosphorous. Somewhat higher percentages may be necessary in feeds for fry or fingerlings. Proper attention to feed storage to prevent excessive heat and moisture and care to always use fresh feed protects feed quality and improves the efficiency with which fish can use it.

Mechanical feeders that spread the feed uniformly around the edges of ponds assure that all fish have an opportunity to eat an adequate amount of feed. This procedure also allows the manager to better observe feeding activity.

Overfeeding is wasteful, costly, and results in unnecessary feed and nutrient inputs to ponds. Although feed consumption depends largely on the weight of fish in a pond, other factors are important in controlling feed consumption. Fish will not eat as well when water temperature is too low or too high. Poor environmental conditions such as low dissolved oxygen concentration and high ammonia concentration or high pH stress fish and depress their appetite as well as their ability to convert consumed food into growth. Disease and parasite problems also will lead to decreased feed consumption by fish. Thus, managers must observe conditions in ponds and the feeding behavior of fish to prevent overfeeding. A sure sign of overfeeding is the accumulation of feed in corners of ponds.

Moderate stocking and feeding rates and adequate mechanical aeration are necessary for assuring good water quality. Mechanical aeration prevents low dissolved oxygen concentrations and fish stress can be avoided. Aeration also improves the effectiveness of the pond ecosystem to assimilate wastes from feeding, and effluents from properly aerated

ponds will not have low dissolved oxygen concentrations.

Dissolved oxygen concentration should be monitored at night, and frequent excursions of dissolved oxygen concentration below 3 or 4 mg/L suggest excessive feeding and less than adequate aeration (See BMP No. 9). Underwater visibility in ponds should not be less than 12 inches even where dissolved oxygen concentrations are adequate. Underwater visibility can be measured best with a Secchi disk (Figure 1). This disk is lowered into the water by a calibrated line until it just disappears. The depth at which the disk disappears is called the Secchi disk visibility. Ponds with excessively dense phytoplankton blooms may have high ammonia concentrations and other water quality problems.



Figure 1. Secchi Disk.

Comment

The feed conversion ratio (FCR) is the weight of feed applied divided by the weight of fish produced. This ratio is very important in pond aquaculture because it indicates the efficiency of feed use. In catfish culture, FCR values on different farms often range from 1.5 to 2.5. A value of 2 is usually considered acceptable, but farmers should strive to reduce the FCR to 1.8 or less. A better FCR will make catfish production more efficient. It will protect effluent quality because nutrient inputs per unit of fish production decline as FCR improves.

References

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